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ON THE
PRESERVATION
OF
SHIPWRECKED MARINERS.



AN
ESSAY
ON THE
PRESERVATION
OF
SHIPWRECKED MARINERS,

IN ANSWER TO THE PRIZE-QUESTIONS

PROPOSED BY

THE ROYAL HUMANE SOCIETY:

- “1. *What are the best Means of preserving Mariners from Shipwreck?*
—2. *Of keeping the Vessel afloat?*—3. *Of giving Assistance to the Crew, when Boats dare not venture out to their Aid?*”

By A. FOTHERGILL, M.D. F.R.S.

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Honorary Member of Medical and Phil. Societies of LOND.
EDINB. PARIS, MANCHEST. PHILADEL. &C.

*Delightful task!—to soften human woe,
“’Tis what the happy to th’ unhappy owe.”*

L O N D O N :

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TO THE
KING'S MOST EXCELLENT MAJESTY,
P A T R O N
OF THE ROYAL HUMANE SOCIETY:

TO THE
RIGHT HONOURABLE THE PRESIDENT,
THE VICE PRESIDENTS,
THE TREASURER,
AND MEDICAL ASSISTANTS,
T H I S E S S A Y,

IS MOST RESPECTFULLY INSCRIBED,

BY THEIR VERY OBEDIENT,

AND FAITHFUL SERVANT,

THE AUTHOR.

LONDON, MARCH 19, 1799.

At a special Meeting of the Directors of
THE ROYAL HUMANE SOCIETY;
Several of the Elder Brethren of the Trinity-
House being present; the PRIZE ESSAYS, on
preserving Mariners from Shipwreck, were read;
when the following RESOLUTIONS passed
unanimously:

- I. *That the ingenious Essay which has for its motto,
“ Delightful task, to soften human woe,” &c.
is a very able and scientific performance, happily
enlisting Philosophy in the cause of Humanity.*
- II. *That, as the precautions which it so earnestly im-
presses may tend to prevent the fatal disasters of
shipwreck, and to preserve the lives of British sea-
men, its publication, especially at this eventful
period, will be peculiarly interesting; and that,
therefore, the permission of the Author be requested.*
- III. *That, on opening the sealed packet, annexed to
the above mentioned Essay, the Author appears to
be Dr. FOTHERGILL of Bath.*

JOHN NICHOLS, *Chairman.*

T O

THE COURT OF DIRECTORS.

GENTLEMEN,

SINCE you were pleased to crown my former Differtation with your HONORARY GOLD MEDAL, I must now, (agreeably to what I long ago hinted,) beg leave to decline any share in your present pecuniary premium. In obedience, however, to your second resolution, respecting the publication of this Essay, I submit to your superior judgement. Since it has been honoured with your sanction, I have re-touched it throughout, in hopes of rendering it more worthy of your approbation. In compliance, therefore, with your obliging request, it now ventures, though not without diffidence, to meet the public eye.

As the naval force of Great Britain is computed to consist of not less than eight hundred ships of war; while her commercial fleets, and trading vessels of various denominations, surpass those of all other nations, disasters at sea, particularly at this juncture, are most seriously to be deprecated. So great, indeed, is the aggregate value of her

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ships,

ships, with their respective cargoes and merchandise, that it can hardly be estimated. Great as it is, however, it can bear no competition with the lives of British seamen on board; yet between them and a watery grave is hourly interposed, only a thin partition of brittle planks!

The present subject, therefore, involving the lives of thousands of our fellow-subjects, and property to an amount almost incalculable, is perhaps one of the most momentous that can, at this time, engage our attention. When, under the signature of a Life Director, I first submitted this question to your consideration, as perfectly congenial to your life-saving institution, it was chiefly with a view to call forth the abilities of ingenious writers and experienced navigators. If the present Essay should ultimately contribute to so important a purpose, by opening a new path of inquiry, I shall think the labour well bestowed.

“*Vice fungar cotis.*”

No philosophical work written expressly on shipwreck having yet reached my notice, the subject to me, appears to be novel, and in a manner untouched*. The following sketch, undertaken

* In contriving various means of forming a line of communication with the shore, that some of the methods proposed by me may have occurred to others, is not improbable, as has been hinted respecting Mr. Bell's experiment. Had
the

taken amidst a variety of avocations, though much short of what I could wish, is yet the best I could produce in so short a time, and with so few materials.

Doubtless the Author may be accused of rashness, in thus venturing out of his native element, and in quitting, at once, *terra firma*, to encounter the dangers of the deep, and to brave the still more stormy sea—of criticism!

Presuming, however, on your wonted candor, that you, my Lords of the Admiralty (in other words, my SUPREME JUDGES), will not be extreme to mark what may seem amiss, I here cheerfully submit to your inspection, my log-book, charts, and such implements as appear necessary to render sea-voyages less perilous, and, in case of shipwreck, to save the lives and property of unfortunate mariners in the hour of distress.

the anonymous writer in a late Morning Chronicle, who claims it as the discovery of another anonymous writer, and published eight years ago in an Anonymous French Journal, brought forth any thing MORE NEW OR MORE PRACTICABLE than what originally appeared in this Essay, when read before the Society in March last, it would assuredly have afforded me much pleasure to have announced it.

But who the original inventor is, if not Mr. Bell, or in which of the numerous French Journals the supposed discovery is recorded, “*this deponent saith not.*” Therefore,

————— “*Si quid novisti rectius istis,
Candidus imperti, si non his utere mecum.*”

GENERAL

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PRELIMINARY OBSERVATIONS

ON THE

FREQUENCY OF SHIPWRECKS,

PARTICULARLY NEAR SHORE.

ILLUSTRATED BY SOME LATE MELANCHOLY EVENTS.

OF all the heavy afflictions incident to a sea-faring-life, shipwreck is the most disastrous. For what can afford a more affecting spectacle than those poor way-worn mariners, who, on their joyful return from a long voyage to the bosom of their families, are unhappily cast away at the very mouth of the harbour! To behold them, in this perilous situation, conflicting with the merciless waves; clinging to the broken planks, or with uplifted hands and piercing shrieks imploring aid with all the eloquence of ineffable

B

woe!

woe! among the crowd of spectators on the beach, see the aged parent, the tender wife, and the helpless children of the distressed sufferers, bathed in tears, and, in the anguish of their souls, pouring forth their unavailing cries and supplications! at length exhausted with ineffectual strugglings, the devoted victims in the agony of despair, are forced to yield to the all-conquering element, and, while casting their last look on the shore, are suddenly overwhelmed in one common undistinguished grave!

Now, this is no feigned picture of imaginary distress, but the genuine recital of a mournful event, which, alas! is too often realised on the British coasts!

An affecting instance of this nature happened not long ago, in open day, and in the face of at least a hundred spectators, to two vessels belonging to Cardigan Bay, which, during a storm, were unfortunately wrecked near the coast. One of them, being in a *decayed* state, sunk within fifty yards of shore, where the crew, being instantly cast on a sand bank, miraculously escaped. But the miserable sufferers in the other vessel, eleven in number, being unable to keep their hold, whilst immense billows broke over them, were washed off one by one, until only one man was left, who tenaciously kept his seat for two hours after his unfortunate companions, when a
prodigious

prodigious wave dashed the wreck to the shore, where it unhappily struck against a rock which forced him back into the foaming surge, and he was seen no more!

Second Case of Shipwreck near Shore.

ACCORDING to an extract of a letter from Baffeterre, of Aug. 3, 1792, the ship *Britannia*, captain Woodyear, with thirty persons, including two women and a child on board, struck on the bar near shore, and soon broke to pieces, leaving the captain with the female passengers and four men on the wreck; all the rest being washed off, except a few who escaped by swimming.

A boat repeatedly attempted to get off to their assistance, but in vain. The captain having exerted every nerve to save the remaining sufferers, particularly the women and child, was at length so completely exhausted as to be utterly unable to prevent their falling a prey to the devouring waves. He, together with his remaining companions, soon underwent the same unhappy fate!

The gallant captain might have swam on shore with his brother, but observed, that his quitting

the ship would dispirit his people, and that he could not think of leaving them, particularly the poor women and child, in so perilous a situation. Thus did he nobly sacrifice his own life in a fruitless effort to preserve theirs!

The lamentations of the people on shore most forcibly expressed their sentiments on this truly distressing event. To increase the horrors of the scene, the brothers and relations of the unfortunate captain were among the spectators; while Mrs. Moore, one of the passengers, was also seen, with her child in her lap, and clinging to her other son and her brother, wringing her hands in the wild agony of despair, while her disconsolate friends on land were unable to afford them the smallest assistance! Next morning the beach was covered with dead bodies that had been cast on shore in the night!

Adieu! ye sons of dire mishap, adieu!

Your toils, and pains, and dangers, are no more;
The tempest now shall howl unheard by you,
While Ocean finishes in vain the trembling shore*.

* See the "Shipwreck," a pathetic poem, written *con amore* by the ingenious captain Falconer, who, having narrowly escaped from a similar disaster, paints the affecting scene from nature.

C A S E III.

Attended with peculiar circumstances.

CAPTAIN M'KAY, in a late pamphlet addressed to his father, gives some interesting particulars respecting the shipwreck of the *Juno*, of which he was the second officer. The ship, he remarks, was *crazy*, and greatly out of repair, before she set out from Rangoon, bound to Madras. This circumstance appears to have been the source of their subsequent misfortunes. For the vessel, being unequal to sustain the violence of the storm which overtook them on their voyage, became leaky, and was cast away on the coast; when the principal part of the crew miserably perished. Out of seventy-two persons on board, Captain M'Kay, with thirteen companions, only survived. But, strange to relate (for the fact, were it not so well attested, would appear almost incredible), this unhappy remnant of the crew, being left on the wreck, subsisted not less than twenty-three days without food!

In describing their unparalleled sufferings during this forlorn situation, Captain M'Kay observes, that the sense of hunger was very tormenting till the fifth day, when it gave way to the still more distressing sensation of extreme thirst. These painful sensations, however, were greatly miti-

gated whenever rain fell copiously, and wet them through their clothes. But, finding the relief only temporary, he had recourse to such other expedients as were at hand.—Sea-water drank liberally, though it operated as a severe purgative, yet afforded considerable refreshment. He next chewed pieces of lead, procured from fragments of the wreck, which, by producing a fresh flow of saliva, alleviated the intense thirst. To silence the cravings arising from that aching void produced by long fasting, and which nothing but nutritious food can fully satisfy, he tried the experiment of forcibly compressing the region of the stomach with both hands, which always afforded immediate relief. Hardened and benumbed with their sufferings, his unhappy comrades seemed to feel very little concern or sympathy one for another.

The idea every now and then of hearing a gun, or seeing a sail, when found only to be an illusion, never failed to embitter their distress. When they gave up life as utterly lost, they expressed less anguish; a state of cruel suspense being more painful than absolute despair.

The preceding melancholy cases of shipwreck are selected from several others, if possible, still more deplorable; over which, however, to spare the sympathetic feelings of the humane Reader, I shall

shall draw the friendly veil. These already related are sufficient to suggest a variety of reflections; and it seemed necessary to give them in detail, as they may afford some useful inferences for the benefit of future navigators.

It appears then, in conformity to what has been already observed, that accidents from shipwreck happen most frequently near shore; and that communication between the distressed vessel and the coast being cut off, prevents that timely aid which might otherwise be administered.

2. That the crazy state of a ship, previous to the voyage, must inevitably increase the danger, and hasten, on the fatal catastrophe.

3. That sailors expert in the art of swimming frequently escape, while their helpless companions miserably perish.

4. That life may sometimes be supported without food the space of twenty-three days; a much longer period than is commonly supposed, and which can only be explained on the principle of absorption. Hence the refreshment experienced by Captain M'Kay and his companions from their bodies being wet with rain. Hence also the relief which Captain Bligh and his men, in their late surprising voyage, obtained, not only from exposure to rain, but also from immersing their clothes in the sea.

The cause of this singular effect seems to be this: The innumerable lymphatic ducts, opening every where over the whole surface of the skin, exert their absorbent power in proportion to the demand. Here, the sailors' bodies being exhausted by long fasting, and nature reduced to her *der-nier* resource, the lymphatic system imbibed with avidity the water, but rejected the salt; otherwise the extreme thirst, instead of being mitigated, would have been greatly increased.

5. It further appears, from Captain M'Kay's observation, that the painful sensation of extreme hunger may be greatly alleviated by compressing the region of the stomach.

6. That this distressing symptom goes off about the fifth day, and gives way to intense thirst, which, in its turn, may also be mitigated by chewing lead, as practised by sailors, in hot climates, who assuage their thirst by rolling in their mouths a leaden bullet. The poisonous quality of the metal, however, renders this a doubtful expedient. To allay thirst, and support the system, Dr. Franklin, with more propriety, had recourse to bathing in sea-water several hours every day, and observed that, however thirsty he was before immersion, he never continued so afterwards: nor did he ever perceive in his mouth any taste of saltness.

In case of extreme scarcity of fresh water, in long voyages, sailors, he remarks, might derive similar advantage by dipping their wearing apparel in the sea, and that without the least danger of cold.

7. That life may be protracted many weeks by mere water alone, will appear less wonderful when it is considered, that water consists of vital and inflammable air, and most probably undergoes a decomposition in the human frame; that its vital portion renews and invigorates the living principle, while its inflammable part supplies nutrition. For it can scarcely be doubted, that marine reptiles and fishes, that can subsist on water alone, are endowed with a power of decomposing it, and converting the inflammable part to their nourishment.

Hence, the swarms of insects in hot climates where inflammable air is copiously generated from putrid substances. Like plants, they thrive amidst putrefaction; convert the noxious effluvia into sustenance; and reject the vital air destined to sustain breathing animals. Were it not for this wise provision, the pernicious effluvia would, in such climates, prove a fruitful source of pestilence, and render a large portion of the globe uninhabitable.

On emergencies, therefore, when fresh water is wanting, sea-water, under proper management, may

may afford a better substitute than is generally imagined.

Here it deserves notice, that water may be preserved sweet, during the longest voyage, by the following simple process. Having filled the cask with water in which quick-lime is quenched, let it stand till the inside of the cask has acquired a thin coat of lime; then rinse out the cask, and re-fill it with fresh water for the voyage, adding a few handfuls of recent charcoal dust, a portion of which may be also kept for use in a bottle tight-corked. It not only preserves water sweet, but even restores putrid or corrupt water, which only requires afterwards to be filtered. This, and all other extraneous substances contained in water, not by *solution*, but *diffusion* only, may be most expeditiously separated by Mr. Peacock's Patent Machine, which has been found, by experiment, to filter 720 gallons of water in twenty-four hours, divesting it of all such accidental impurities. This invention promises much utility to persons by land, as well as by sea, and may be seen at the Surveyor's Office, Guildhall, London.

8. To prevent in future voyages the terrible calamity of famine at sea, portable soup and farinaceous vegetables ought to constitute part of the ship's provisions. To assuage the sensation of hunger, and enable the body to bear long fasting,
ole-

oleaginous substances are well adapted, as beef and mutton suet, rich cheese, fresh butter, sweet almonds, also mucilaginous substances, as salop, tapioca, and particularly gum arabic, which, according to M. Haffelquist, supported more than one thousand persons in the deserts of Arabia, who, being left destitute of other provisions, subsisted upon it solely during the space of two months.

9. The treatment of shipwrecked mariners when nearly exhausted by cold and hunger, demands no small circumspection. At first they loath the sight of meat; but on a sudden the appetite grows voracious, and prompts them to devour more food than the digestive organs can assimilate. Their native warmth also, being greatly impaired, should be very gradually restored by a tepid bath; and the food should consist of new milk, barley-water, or weak broth, in very small quantity, which, in this state of more than infantile debility, will be found sufficiently powerful; avoiding, at the same time, the common error of pouring down wine, spirits, or other stimulating cordials, which, instead of supporting life, too often exhaust the feeble remnant of vitality*.

* See Dr. Percival's affecting narrative of the sufferings of a collier, who was confined seven days in a coal-pit without sustenance. *Memoirs of the Philosophical Society of Manchester*, vol. II. p. 467.

CAUSES OF STORMS AND SHIPWRECKS—
—whether influenced by local circumstances.—

THE most obvious cause of shipwreck, according to the language of seamen, is a heavy gale of wind with a lee shore.

Though the tides are produced by the joint influence of the sun and moon, the stormy waves depend wholly on winds of the higher order. Air possesses not only a chemical but mechanical attraction for water, superior to that which obtains between the component parts of the latter. When air, therefore, rapidly sweeps along the surface of water, it forcibly seizes the upper stratum, and raises it aloft in a surprising manner, until the water, by its superior gravity, suddenly recovers its level. This powerful action and reaction between the contending elements constitutes a sea-storm, which, according to its violence, raises the billows from twelve to twenty feet, sometimes to a much greater altitude, as in tornadoes and hurricanes, when the sea (as the sailors express it) runs mountains high.

Now, hurricanes may proceed from local rarefaction, or whatever suddenly disturbs the equilibrium of the atmosphere, but principally from an accumulation of the electrical fluid, which has a powerful tendency towards pointed or angular bodies

bodies to restore the balance. Hence, perhaps, it is, that lofty promontories, high cliffs, and rocky projecting shores, are so often infested with violent storms, while the main sea remains calm and unruffled. In such situations, the effects of the warring elements are often dreadful, and the disasters produced amongst the neighbouring vessels truly deplorable.

Of a tempest at sea, Thompson gives the following sublime and picturesque description :

“ Then comes the Father of the Tempest forth
Wrapt in black glooms——

Lash'd into foam, the fierce conflicting brine
Seems o'er a thousand raging waves to burn ;
Mean time, the mountain billows to the clouds
In direful tumult swell'd—furge after surge,
Burst into chaos, with tremendous roar !

* * * * *

They boil and wheel and foam and thunder thro'
And anchor'd navies from their station drive !”

Along the British and other neighbouring coasts, the equinoctial storms are generally the most formidable. As these are to be expected at their respective seasons, all prudent navigators ought to provide against their periodical return.

In tropical climates, and along the abrupt coasts of the Leeward Islands, the most violent hurricanes prevail between the 25th of July and the

the latter end of September, the wind blowing from the N. or N. W. in direct opposition to the trade winds.

Prognostic signs of a Hurricane.

THE native Carribees of St. Dominica and St. Vincent, from long observation, can with surprising accuracy foretel the approach of the hurricane ten or twelve days before it arrives,—a circumstance of no small moment to inexperienced navigators.

All hurricanes, they observe, happen about the period of the lunations, particularly at full moon, and may be predicted from the following signs:

1st. The sun exhibits a blood-like redness.—The moon surrounded with a halo, the stars with a bur, and seem larger than usual.—The sky, towards the N. W. dark and gloomy.—Wells and deep caverns send forth a hollow sound.—The sea, an unusual rank odor.—Mists disappear on the tops of mountains—a calm succeeds—when on a sudden the hurricane bursts forth with incredible impetuosity, twists trees asunder, dismasts ships, and drives them a-shore, sometimes above twenty yards beyond the water-mark!

As soon as the wind veers from N. W. to E. or S. E. the hurricane ceases; yet, what is remarkable, the raging of the waves continues and
even

even increases in proportion to the *momentum* of the impulse already acquired, till at length, the tempest having spent its fury, the billows subside, and the sea gradually resumes its former tranquillity. Hence may be also understood, why the tide continues to flow at least forty-eight hours after the full and change; its altitude at Bristol often amounting to forty-seven feet, or upwards.

Besides tempests at sea, including hurricanes, thunder-storms, and water-spouts, there are still other causes which too often produce shipwreck.

Sea-faring men, inured to hardships, and taught by example to despise dangers, are often totally regardless of forecast, and even of the necessary means of self-preservation. To unpardonable negligence, or fool-hardiness, therefore, rather than to unavoidable misfortune, may many of their disasters be justly imputed. To what else can be attributed the entire loss of the Royal George, and of the *Hafwell*, with their respective companies? or of the late tremendous explosion of the *La Coquille*? and other still more recent disasters?

From the master down to the common tar, the same *nonchalance*, the same contempt of danger, frequently pervades the whole crew. Thus, when the master embarks on board a decayed leaky vessel unfit to bear stress of weather; when the sleepy pilot, dozing at the helm, runs the ship on
some

some noted rock or lee-shore; or, when the drunken sailor, with a lighted candle, carelessly approaches too near a cask of spirits, or gunpowder; what in the name of wonder can be expected but inevitable ruin! Under such management, can we be surpris'd that fatal accidents befall so many of our trading vessels, not only in long voyages, but even in making a short trip across the channel? It was by a very different conduct, guided by prudence and marked by unremitting attention, that Captain Cook, and other expert circum-navigators, performed their successful voyages round the globe; and that Captain Bligh, in an open boat amidst frequent storms, traversed the great Pacific Ocean.

*Hints for improving naval architecture.—For rendering boats incapable of upsetting or sinking.—
—The Life Boat at Shields—its singular utility.*

THOUGH shipwreck, under certain circumstances, perhaps, cannot by any human means be prevented; yet there seems reason to hope it may, in future, be rendered less frequent and less fatal, by observing the subsequent precautions.

1. Respecting the state of the ship.
2. The conduct of the commander.

ist. From late discoveries respecting floating bodies, and a comparative view of the ships of different nations, the board of naval architecture will, it is hoped, be enabled to suggest many useful improvements in the construction of all kinds of vessels, and by well conducted experiments to reduce the art of ship-building to a more regular science.

In the interim, let ships of every denomination, previous to the intended voyage, undergo a more strict examination by competent and impartial judges, that such as are materially damaged or worn out be condemned, and none permitted to sail unless they can be safely warranted.

2dly. Let tall-masted vessels and ships of burthen be well armed with electrical conductors. For though it be beyond human power to arrest the rapid lightning in its flight, yet reason, enlightened by experimental philosophy, has taught us how to divest it of a considerable part of its terrors, by the use of metallic rods. But, in order to prevent their being melted by the lightning, let a pointed piece of black lead be inserted at their tops, projecting about two inches above the metallic sockets; and to guard them against rust, which would destroy their conducting power, let the rods be sheathed with tin or copper.

3dly. To render ships more durable with less expence of timber, it has been lately recommended, by Mr. Bosquet, to fill up all the void spaces between the planks, lining, and timbers, with a composition of melted pitch, tar, and glue, adding a certain quantity of cork-shavings and charcoal dust. This not only prevents rats harbouring in the cavities, but also the accumulation of bilge water and foul air, so highly injurious to mariners. Ships thus fortified by his patent invention, being rendered sound and durable, would, he imagines, rarely be subject to leakage or foundering at sea*.

In the construction of ships, for safety as well as swiftness, Sir George Shee advises to add to their length and width, and to diminish considerably their height. By reversing this, and by crowding too much sail, light vessels and pleasure barges become unfit to encounter sudden gusts of wind, and are frequently upset.

4thly. To prevent accidents of this nature, Mr. Miller of Dalswinton, in his specification of a patent invention of a vessel for passengers or parties of pleasure, incapable of being upset, proposes his flat-bottomed boat, which draws very

* The Specification of the invention may be seen in the Repertory of Arts, Vol. IX. p. 381.

little water. It moves with wheels in the water; wrought by capstans; roomy between decks for the accommodation of numerous passengers, and requires no pumps*.

The seamen of Trinity House, at Leith, recommend, for safety, a boat carrying more ballast than necessary for ordinary sailing; over the ballast, bags filled with cork, rising higher than the gunnels; the whole properly secured by sailcloth and ropes. By this contrivance, they allege, that all persons on board, or even others holding by the boat, will be carried safe through the most stormy breakers. On similar principles, and to answer the same end, other boats have been constructed by ingenious persons in America, in Italy, and in Holland. The patent boat of Mr. Lukin, coachmaker, in London, which, we are told, can neither overset, nor sink, though filled with water, is formed with projecting gunnales, sloping from the top, armed with cork, and secured with leather or tin. Of which a more full description is given in the "Repertory of Arts," vol. III. p. 10.

Count Berchtold, of Tuscany, well known for his zeal in the cause of humanity, not long ago presented to the Society for the Encouragement of Arts, in London, a curious model of a boat, with

* Repertory, Vol. VI.

necessary apparatus for assisting persons in danger of drowning, by the breaking of ice, which may be viewed at the Society's rooms, in the Adelphi, by application to the secretary.

The Greenlanders have invented a boat of a singular construction, resembling a huge inflated bladder, inclosed with seal skins, and rendered water-proof, in which they can sit at ease, while they ply their oars, and thus encounter their stormy seas in perfect safety. One of these boats may be seen in the British Museum; or an accurate description with an engraving, in the first volume of Crantz's History of Greenland.



*The LIFE BOAT, at Shields.—Its singular Utility
evinced by repeated Trials.—*

THIS noted boat, by which, within the course of a few years, many lives and much property have been saved, was built by Mr. Greathead, an able ship-builder, and generously presented to the inhabitants of South Shields by his Grace the Duke of Northumberland, by whose beneficence North Shields has also since been supplied with a boat of a similar construction.

Mr. Fairless, who furnished some useful hints respecting the original plan, describes the vessel
“ as measuring 30 feet by 10; resembling, in
form,

form, a common Greenland boat, only flatter in the bottom. The weight of cork employed in the construction is about 7 *cwt*, with which the boat is lined, inside and outside of the gunnales, two feet in breadth; the seats being also filled with the same: rowed by ten men, double-banked, and steered by one at each end with oars, being alike at both ends, and with a contrivance to prevent sinking in the sand.

“ She draws very little water, and can carry twenty persons, even when full of water. Being water-proof, and rendered boyant by cork, she keeps afloat, preserving her equilibrium without danger of upsetting, and is able to contend against the most tremendous sea, having never in any one instance yet failed of conveying a distressed ship’s crew into safety.

“ In going off with her, in the highest seas and broken water, the men testify no dread; and, though cork-jackets were provided for them, yet such is their confidence in the boat, that they now refuse to use them.

“ Indeed, she has surprised every intelligent seaman that has seen her contend with the boisterous waves. Any farther description I can give,” adds Mr. Fairless, “ will not be equal to a view of the model kept at Northumberland House, in London, which, I make no doubt, you may see. Such a vessel ought to be provided with high

wheels, to convey it to the place where it is immediately wanted.

“The boat complete, and copper-nailed, cost about 150*l*.” But, in the moment of distress; what shipwrecked mariner would not think this a cheap purchase, and pronounce the value of such a boat as truly inestimable!

*Other late discoveries for the prevention of Shipwreck,
and preservation of Mariners.*

[*From American and Batavian correspondence.*]

1. AN expert American seaman recommends to mariners the experiment of hanging out a line of cable over the stern of a small vessel, or boat, in a rough sea, as this appendage serves to make a long wake, and will be found to enable the vessel (according to the sea term) to live much longer in a heavy gale. Little danger, he observes, is to be apprehended from a long sweeping swell of the sea; the mischief generally arises from overhanging surges, which at once break in and overwhelm the vessel. Having often experienced, in stormy weather, the beneficial effects of a long coil of rope fixed to a flat piece of wood, and appended to vessels, he thence endeavours to explain the extraordinary efficacy of the tow-line in balancing the ship, and lowering the high-swellings surge.

2. From

2. From the Transactions of the Philosophical Society, at Philadelphia, we learn, that Mr. Hopkinson has invented an instrument, with a graduated tube, which, from the difference of specific gravity between oil and water, by its rise and fall, accurately measures the ship's progress. Also, a curious spring block, by which sailing is greatly expedited; for which useful invention he obtained the Society's gold medal.

3. Mr. Gearson, of York-town, Pennsylvania, has lately obtained a patent for an important invention, by means of which, we are informed, that a vessel whose bottom is so shattered, that the ordinary pumps could not, for one hour, prevent her sinking, will be effectually kept buoyant; and, though under a press of sail, be incapable of being overset by the heaviest gale.

4. A gentleman of Rotterdam has invented a new floating machine, which, though small, is capable of holding four men commodiously, and may be enlarged sufficiently to accommodate fifty, if required. So curious is its construction, we are told, as to enable it to withstand the utmost fury of the winds and seas. It can neither overset, nor sink, and may therefore, in the most stormy weather, be steered whatever course the pilot shall see necessary. These last may be con-

sidered as different modifications of the life-boat, constructed with the same humane views, though probably without any communication between the respective artists. Were packet-boats destined to convey important dispatches thus constructed, many unfortunate accidents might be prevented.

The comparative value of these and other laudable inventions, whether produced by foreigners, or our own countrymen, must rest with their ingenious authors, at least, till their respective merits be fully ascertained by actual experiment. Were models of every new and useful contrivance, of this nature, consigned to the board of Naval Architecture, for public inspection, the display of such an assemblage of mechanism would excite emulation, and the result of satisfactory trials, if communicated from time to time, might prove highly important to the maritime world,

To ascertain the ship's burthen.

5. It is certain, that a ship will carry a weight equal to that of a quantity of water, of the same bulk with itself, deducting, however, the weight of metal employed in its construction; for the wood is nearly of the same weight with water. Were it not for the iron, or other metal, a ship might float though full of water. However it be loaded, therefore, it will not entirely sink as long

as the weight of its cargo is less than that of an equal bulk of water.

Now, to ascertain this, the capacity of the ship must be measured. Suppose it to be 1000 cubical feet, multiply that by 73 pounds, the average weight of a cubical foot of sea-water (taken at a proper distance from shore), which gives in the product 73,000 pounds for the weight of a bulk of water equal to that of the ship, the burthen of the ship being 73,000 pounds, or 36 ton and a half, reckoning a ton 2000 pounds, that being the weight of a-ton of sea-water. If the cargo exceeds 36 ton and half, the ship will sink; if just 73,000 pounds, she will swim, though very deep in the water, and on the very point of sinking. And though she may float at sea, she will sink on entering the mouth of a river; fresh water being specifically lighter than sea-water, and in the proportion of about 63 to 73.

Previous to the voyage, therefore, the ship's burthen ought to be more carefully ascertained than, perhaps, raw inexperienced navigators have hitherto imagined.

The ship's pumps.

6. The pumps ought to be formed on the most approved plan, and kept in perfect order. Some prefer

prefer Mr. Fulton's patent pump, worked by a cylinder, and described in the Repertory of Arts, vol. III.

Mr. Clarke, Surgeon, at Sunderland, proposes an easier and more expeditious method of working the pumps, by means of a curved lever, which acts by an easy motion of the body, as in rowing. It has been found, on trial, to deliver twice the quantity of water, and with far less labour, than that with the brake--a circumstance of no small consequence, especially when seamen are almost worn out with sickness or fatigue*.

Mr. Dearborn, an ingenious American mechanic, has accomplished a still farther improvement, by constructing a new machine to answer the double purpose of a pump and a fire-engine †.

Mr. Taylor, of Southampton, we are credibly informed, has invented a ship pump, which, in point of simplicity and ingenuity, surpasses all others, and bids fair to supersede them in the British navy.

Ship's compass.

7. The magnetic power of the mariner's compass is liable to be disturbed by various accidents, as the rolling of the ship in a rough sea, the explosion of the great guns, and particularly lightning. Nay, even the electricity of the glass

* See Repertory, Vol. IX.

† Ibid. vol. III.

cover, when excited by the slightest accidental friction, is sufficient to alter its direction; but this can be soon remedied by wetting the glass, which carries off the electricity. In thunder storms at sea, the polarity of the needle has sometimes been suddenly reversed, and irreparably damaged, by the North and South points changing their station, occasioning, at the same time, dangerous errors. By this accident, a ship has been known to take a retrograde course, and steer above 100 leagues by a needle, the polarity of which had thus been totally changed*.

The compass, though long known, was imperfect and liable to many inconveniencies, till at length, by the ingenuity of Dr. Knight, it was greatly improved; and has since undergone a further emendation by Mr. Smeaton. The improvement consists in the shape and temper of the needle; in the discovery of proper means for restoring the loss of magnetism in a voyage; and, finally, in rendering it less subject to be influenced by the motions of the ship. These contrivances, though found too delicate always to sustain with impunity the rude shocks of a tempestuous sea, or the more violent stroke of lightning, are, however, the best that have been yet discovered. Therefore, as this improved compass is allowed to be superior to others, and is now generally used in the royal

* Phil. Trans. Abridged, by Lowthorp, vol. II. p. 180.

navy, it ought certainly to be provided for all merchant ships, particularly on long voyages.

Ship's Rudder.

8. The power of the rudder being reducible to that of the lever, and oblique action of the water, the most advantageous angle made by the helm from the keel, mathematicians have fixed at $54^{\circ} 44'$. Euler recommends an obliquity somewhat less; and establishes this rule, that an obliquity of 48° will, in general, produce the most powerful effect; though experience testifies, that a ship steers tolerably well when the rudder makes an angle of only 35° .

A convenient substitute for the loss of a rudder has been invented by captain Pakenham, for which useful device the Society of Arts presented him with a gold medal. The method, being described at large in the Society's Transactions, need not be repeated in this place.

Masts.

9. To the mechanical genius of captain Pakenham, the navy is also indebted for an easy, cheap, and expeditious, method of restoring a mast, when injured, or decayed, by simply inverting the mast and turning the heel to the head; of which

which the Society, in the 10th volume of their Transactions, have given a full description, illustrated with an engraving.

The sudden damage which masts frequently sustain from sea-storms and naval engagements, and which, in the ordinary way, require from six to eight weeks to refit, may thus, we are assured, be repaired within forty-eight hours; and that this method is equally applicable to all ships, from a first-rate, to the smallest merchantman—a matter of no small consequence on long voyages, or in time of war.

Nautical Apparatus.

10. A ship, properly equipped for a long voyage, ought to be provided with a complete set of nautical instruments, including an accurate thermometer, barometer, and time-piece. Also, a life-boat, cork jackets, cords, drags, buoys, and other implements for the prevention of drowning.

Thermometer.

From the result of three successive voyages from Europe to America, captain Williams, under the direction of Dr. Franklin, found the temperature of the main ocean, out of soundings, at least

least ten degrees warmer than in shallower water near the coast. Hence the thermometer may serve a new and important purpose in pointing out the near approach to shore; also, in detecting latent rocks, or banks of sand or coral, concealed under water. Is the decrease of temperature owing to these solid bodies acting as conductors, and thus conveying off the heat?

Nautical Time-piece.

A curious and unsuspected cause of inaccuracy in watches, or time-pieces, has lately been discovered by an ingenious artist, which well deserves notice. The balance, being made of steel, is very liable to acquire a polarity, which disturbs the regularity of its movement, according as the watch happens to be placed North and South, or in the vicinity of a knife, a key, or other steel utensil. On trying a variety of steel balances, by floating them on cork, placed on the surface of water, Mr. Varley could scarcely select one that did not betray some sign of polarity; nor can this be easily prevented, but by substituting a balance of gold, or some other metal. May not this be one reason why that grand *desideratum*, a perfectly correct time-piece for discovering the longitude at sea, has not yet been produced?

To prevent accidents during long voyages, the Transactions of the Royal Society of London suggest many important hints; which, however, for the sake of brevity, must be omitted, by referring the reader to the respective passages, *viz.*

1. To preserve vessels from the worm, by a more cheap and durable method than that of sheathing; also, to prevent leakage from the same cause.—See Phil. Transf. vol. VIII. p. 6192.—Vol. XLIII. p. 37c.

2. To preserve the health and lives of men crowded in slave ships, and transports, by ventilators, and other means.—Vols. XLIV, and XLVII. p. 211.

3. To measure the ship's way more correctly than by the log, &c.—Vols. XXXIII, and XXXVIII.

Also, a still later method, with improvements. See Memoirs of the American Philosophical Society, vol. II.

*Hints respecting the Conduct of the Captain and
his Mates.*

HAVING briefly discussed the principal objects respecting the state of the ship, and the precautions necessary to be taken previous to the voyage, we now proceed humbly to suggest a few

few hints proper to be observed by the master and his mates.

1. Having provided all the requisites necessary to the complete equipment of the vessel, it becomes the master to use every necessary precaution against disasters, and to be prepared to meet the event whatever it may be.

2. Like the intrepid captain Riou, and the gallant and humane captain Woodyear, he should resolve, in case of distress, to preserve discipline through the whole scene, and to discharge his duty by being the last man to quit the shattered vessel. By thus manfully preserving his authority, good order will be kept up till, possibly, some timely aid may be obtained, or the ship got into harbour. But if in the time of danger he quit his post, from that moment discipline is at an end, anarchy prevails, and ruin ensues.

3. His shipmates, and whole company under his command, in their several departments, must cheerfully obey his orders, and with alacrity give every possible assistance in the management of the vessel, and in affording one another mutual aid.

4. In the critical hour of distress, to prevent the additional danger of strife, or mutiny, let the captain resolve to prevent intoxication. Should this prove impracticable, let him order every cask of spirits to be staved.

5. Dr. Franklin's experiment of smoothing the rough undulations of a fresh water-lake to the extent

tent of half an acre, by pouring on its surface a small portion of oil, is extremely curious, though its efficacy in calming the waves of a troubled sea, as recorded by Pliny, certainly wants confirmation. By suffering the wind to glide over it, as over a surface of ice, it seems rather calculated to prevent new waves forming, than to controul those already formed.

Nevertheless, Count Bentinck, in the sixty-fourth volume of the Philosophical Transactions, gives a remarkable case, attested by the officers on-board, respecting a Dutch East India ship, which was happily preserved in a storm by gradually pouring into the sea a considerable quantity of Olive Oil. Merchant ships, with large cargoes of oil, might easily put this matter to the test. At all events, empty casks, in case of shipwreck, being well secured between decks, the air they contain may, in proportion to the space they occupy, tend to keep the vessel afloat; or, casks bound to rafts may afford seasonable means of saving those persons who cannot swim.

6. In tropical climates, and particularly in the Leeward Islands, the signs already mentioned, which precede the most dreadful hurricanes, several days before their arrival, if duly attended to in time, may enable the master not only to foretell the storm, but to ward off the impending danger. Convinced of this by long observation,

that experienced seaman Captain Langford recommends the following precautions: "To keep
 " the ship failable with store of ballast—ports well
 " barred and caulked—top-masts down—yards
 " a-part laced—doors and windows well secured.
 " Let all ships at anchor quit the road, or they
 " will be driven a-shore. As the storm always
 " begins at North and North-West, till it comes
 " to South-East, when its fury subsides; let them
 " run to the South for ample sea-room, and for
 " drift of *the* South West, and there wait the
 " event." Observing these cautions, he providentially weathered out five dreadful hurricanes without the loss of sail, yard, or mast. Other commanders, he adds, who listened to his predictions and followed his advice, likewise escaped damage, and returned safe*.

7. Where the violence of the tempest baffles all human forecast, and the shattered vessel ready to sink becomes totally unmanageable, when signals of distress have been repeated in vain; and when terror and dismay hang on every countenance, it requires no common share of fortitude in the Commander to act with that coolness, prudence, and promptitude, which the exigency of the case so evidently demands.

Shipwreck being inevitable, it behoves him to exert himself to save as many lives as he possibly can, by a spirited and impartial conduct,

* Phil. Trans. Abr. Vol. II. p. 105.

and by a proper distribution of the cork-waist-coats, ropes, implements, and whatever may seem useful; to guard against the boats being suddenly over-crowded, and also to be watchful on such critical occasions, that men apparently dead from drowning, or other accidents, be not hastily thrown overboard, until suitable means of recovery have failed, or life be totally extinguished*.

The Captain having thus discharged his duty, and exerted every effort to extricate his comrades from their calamity, though without the smallest prospect of success, nothing now remains but that he, as becomes a helpless mortal, commit himself and crew to the protection of Him “who rides in the whirlwind, and directs the storm”—who can say to the raging sea, “Hitherto shalt thou go, and no farther; and here shall thy proud waves be stayed.” Impressed with sentiments of this nature, so congenial to the mind of a dependent being, particularly in the hour of distress, Captain Falconer, in the true spirit of devotion, bursts forth into the following beautiful apostrophe:

“O! SOURCE OF LIFE, our Refuge and our Stay!
 Whose voice the warring elements obey;
 On THY SUPREME assistance we rely,
 Thy mercy supplicate,—if doom’d to die:
 Perhaps this storm is sent, with healing breath,
 From neighboring shores—to scourge disease and death.”

Shipwreck.

* The mode of treatment has been already fully discussed. See New Inquiry on Vital Suspension, Edit. 3. and Preservative Plan annexed. page 40. on premature burial.

8. When a vessel is cast away, within a small distance of shore (as in the late melancholy accidents, which gave rise to these reflections), the country people hasten in crowds to view the affecting spectacle; some with an eager desire to assist the wretched sufferers; others, (horrible to relate!) for the sole purpose of plunder! In order to prevent the cruel depredations of those inhuman barbarians, a peace-officer ought always to be present, attended by the principal inhabitants; and assisted, if required, by a military force*.

He

* According to the ancient law, goods cast on shore by the waves belonged to the King: but the rigour of this law has since been wisely mitigated in favour of the distressed proprietors: and it is now held, that, not only if any living animal escape, but if proof can be made of the property of any of the goods cast on shore, within a year and a day, they shall not be forfeited as a legal wreck, but kept in the custody of the Sheriff, during that period, unless previously claimed by the proprietor. If the goods be of a perishable nature, the Sheriff may sell them, and the purchase-money shall be liable in their stead.

2. Whoever shall secret any goods from a wreck shall forfeit treble their value. To steal even a plank from a ship in distress, says Judge Blackstone, renders the party liable to answer for the whole vessel and cargo.

3. Whoever perpetrates any wilful act, by which the ship is lost, or plunders the vessel in distress, or prevents the escape of any of the sufferers, or hangs out false lights, to decoy a vessel into danger, is declared by the law to be guilty of a capital felony, without benefit of clergy.

He should be empowered to offer premiums for the preservation of life and property, and to encourage watermen to face the boisterous sea in life-boats kept ready for the purpose. But on these mournful occasions, the minds of the more humane and civilized spectators are generally too much agitated to supply the aid that is so much wanted, or to suggest any means of succour, but such as are totally inadequate. Nor is this to be wondered at: the moment of danger is not the moment of reflection, nor can new resources be struck out without the rare and happy talent of invention, and the cool reasoning of a mind at ease. From want of a life-boat, and other necessary expedients, how often are ships and their cargoes irretrievably lost, which otherwise might have been saved!

4. It is also enacted, that all head officers on the coast shall, on application being made to them, instantly summon as many persons as are necessary to the relief of any ship in distress, on forfeiture of one hundred pounds. And, in case of due assistance given, salvage shall be paid by the owners, to be assessed by the neighbouring justices.

5. The income of wrecks being generally granted by the King to the Lord of the Manor, as a royal franchise, is seldom, it is hoped, rigorously claimed, but rather given up to the distressed sufferers. Such claims, however, might be easily compromised, as the right owner, if discovered any time within a full twelvemonth, can supersede the Lord of the Manor, or any other claimant, and by virtue of this law recover his property.

Hints for conveying Assistance to a Ship in distress, by forming a line of communication with the shore.

WITH what ease a large log of timber, or other heavy body, may be floated along the surface of water, by only a moderate-sized cord attached to it, is well known.

Could means once be contrived of conveying such a cord to or from a ship in distress, to form a line of communication between the mast and a fixed point on shore, one grand difficulty would be surmounted. For to this line of communication might be fixed collateral cords, which being conveyed to the sufferers, grasping the broken planks, or struggling in the waves, many lives might probably be saved.

Now, were the line sufficiently strong, and made to pass through a metallic cylinder, in form of a sliding hoop, the ship's crew might, one by one, if placed thereon, slide along the rope from the mast to the shore, as on an inclined plane. The ship's stores, buckled to the sliding hoop, might be conveyed in the same manner; nay, even the ship itself, drifted on a neighbouring sand-bank, or ledge of rocks, might, by men properly stationed on the beach, be thus towed safely to shore.

That this might be safely accomplished during a calm, can scarcely be doubted: but how to convey

vey a line to or from the ship when all communication is cut off by a boisterous sea, and “when not even a boat dare venture out,” must give us pause, and at first view appear impracticable.— Dangerous as such an enterprize may seem, yet we now know, that a life-boat built on scientific principles, and manned with a few resolute tars, is fully adequate to the task; such a boat, however, being yet little known, and no where to be met with, except at Shields, recourse must be had to other measures. Those who have duly considered the theory of projectiles, will be best qualified to judge how far the following conjectures, when matured by experience, may bring to light new modes of deliverance.

1st, Suppose the distance not to exceed two hundred yards, might not a small cord of that length be transmitted from the ship to the shore by a powerful sky-rocket properly directed?

2d, By an arrow shot from a large bow of superior force?

3d, By a cord fixed to a perforated bullet, and discharged from a musket or small piece of ordnance, taking care to first wet the cord to prevent its being fired by the explosion? To the end of the small cord thus conveyed to the shore, might be fixed a larger one, or even a rope, which, by means of the small cord, might be drawn on board the ship.

4. Might not the conveyance of one or more cords be accomplished, with still more certainty, from the people on shore to the distressed ship, by means of a stout water-spaniel, or rather by a well-trained Newfoundland-dog? These sagacious animals are known to delight in enterprize, and in rescuing persons in the act of drowning. Were they once brought to encounter a rough sea, and with cords fastened to their collars, taught to plunge-in at the word of command, making regular excursions to and from the wreck, many valuable lives might probably thus be preserved.

In such disasters, not only the sufferers, but spectators, are apt to lose all presence of mind; otherwise expedients might often be contrived for rescuing helpless mariners in their distress.

6. Might not Dr. Franklin's experiment, with a large paper kite, deserve a trial, especially in the direction of a fair wind and lee-shore?

7. Might not a courageous rider, mounted on a steady well-trained horse, sometimes be very useful on these trying occasions? The horse, it ought to be remembered, swims with his nose and eyes just above water; but, if imprudently checked by the bridle, it proves fatal both to him and the rider. The heroic conduct of Cornelius Voltemed, a Dutchman, at the Cape of Good Hope, can never be sufficiently admired, nor his unhappy fate too sincerely deplored. In order to
assist

assist fourteen persons belonging to a vessel stranded near the coast, his intrepid philanthropy impelled him to ride his horse repeatedly into the sea; having at length happily succeeded in saving all but one, his strength failed, and in his last generous attempt to rescue that one unfortunately lost his own life!

The Dutch, in order to prevent plunder, ordain that no person shall approach the ship on pain of death; but this excessive zeal for the protection of property, so truly characteristic of the nation, generally damps every zealous effort for rescuing the forlorn sufferers. Had, therefore, the virtuous, the humane Voltimed even escaped the perils of the sea, he would, nevertheless, have been tried for his life by his unfeeling countrymen!

8. Vessels being most frequently cast away on a lee-shore, the difficulty of sending out assistance is greatly increased by that circumstance; but, were the sailors to fix a line to an empty cask, or buoy; the direction of the wind and tide, being favourable, would forcibly impel it from the wreck towards the beach; where assistance would be ready to fasten the line to some neighbouring tree or post.

9. But what seems to bid fairest for establishing a line of communication with the shore, is a late contrivance invented by Mr. Bell, of the Royal Artillery, which, on reading the account, I am
glad

glad to find, coincides with my own proposal, respecting the transmission of a cord with a bullet by gun-shot. Concerning the result of the Experiment, the Society of Arts have published the following favourable report :

“ To ascertain the merit of Mr. Bell’s invention, his Grace the Duke of Richmond having given directions, proper trials were accordingly made, by throwing a loaded shell * on shore from a small mortar fixed in a boat, moored in the river Thames, above two hundred yards from the shore. To the shell was attached a rope, one end of which remained on board the boat. The shell, falling about a hundred yards within land, buried itself full eighteen inches in the gravel; when Mr. Bell and another person, on a raft floated by casks properly ballasted, hauled themselves on shore in a few minutes, by means of the rope above mentioned.

“ These trials, having been repeated three times successively with the desired success, and it appearing that the method, proposed by Mr. Bell, of throwing a line on shore from a ship in distress, either stranded, or in danger of being so, promises to be of very important advantage to the maritime world; as by means thereof such vessel
 * By which is meant a shell filled with lead, to which, a staple or ring being fixed, the rope is to be made fast. The shell thus loaded weighed about seventy pounds, being eight inches in diameter.

may obtain relief, any person, when landed, being enabled to secure ropes from the ship; or additional hands may thereby be conveyed from the shore to assist those on board. In cases of imminent danger, moreover, where all hopes of saving the vessel may be lost, Mr. Bell's method offers the most probable means of saving the crew.

“The Society therefore voted to Mr. Bell a bounty of fifty guineas, on his leaving with the Society a complete model of his contrivance; which model is reserved in their Repository, for the inspection and use of the Public*.”

That this, or other similar inventions may prove useful in time of need, the apparatus must be provided beforehand; and ought to constitute a part of the ship's equipment previous to the voyage.

New Plan for the Prevention of a Ship's sinking.

A Philosophical Correspondent has favoured me with the following communication, which displays much ingenuity, and seems worthy of further inquiry.

* Transactions of the Society of Arts, &c. Vol. X. p. 203.
See also Raccolta di Salyar, l'equipaggio d'un Bastimento, &c. by Count Berchtold, with an elegant engraving, descriptive of the entire apparatus.

“ As you wish, my dear Sir, for further intelligence, respecting the means I should propose for preventing ships from sinking, I will endeavour to give you some idea of the power of the apparatus. Its constituent parts are these :

“ A pair of cylindrical flexible vessels, rendered impervious both to air and water by means of elastic resin, and a four-barrelled pump for inflating them. As the contents of cylinders increase in proportion to the squares of their diameters, such may be enlarged or diminished to equal the power in request; consequently both the pumps and air-vessels may be readily apportioned to the duty they have to perform. From the diameter of the cylinders of the pump, to judge of their discharge, we must consider the length of the stroke within the reach of middle-sized men, and the number of discharges which may be made in a given time. With the aid of simple mechanism, I have accomplished a perpendicular stroke of two feet, capable of being repeated from sixty to seventy times with ease, and from eighty to an hundred, if requested, in 2 minute.

“ Air is a fluid of so volatile a nature, that the slightest pressure impels it forward; four men, therefore, can pump in more air than four hundred men can pump out water.

“ That

“ That vessels of canvas may be made, at the same time, both flexible and air-tight, hath been demonstratively proved already. Such vessels, in their flaccid state, occupy little more space than a folded sail, and consequently are stowable in a narrow compass, till wanted. When immersed and inflated, they remove a quantity of water adequate to the air which they contain, and, if fixed to a ponderous body, give it a degree of buoyancy proportionate to the water they displace. If this be equal to the difference in weight between that body and an equal bulk of the fluid which surrounds it, the whole will rest suspended even with or near the surface of the fluid. Enlarge their contents, and turn the balance in favour of the sinking body, it will rise and float. Fix sufficient buoyant powers, therefore, to the sides of a ship, in such manner that they cannot break loose; though a plank should start in her bottom, she still would float.

“ One method, then, of preventing a ship from sinking may be by a brace of air-vessels occasionally lashed to her sides. Another is, that of inflating a brace within her. To bring the former to effect requires a more perfect knowledge of the strength of cordage than the most experienced rope maker can boast. Our best calculators egregiously err in this particular; for, instead of its increasing in proportion to the square

square * of the diameter of the cordage, it comes far nearer to the proportion of the simple diameter only, as numerous experiments with the best new town-made ropes of various sizes have convinced me. In the first mode, therefore, several difficulties remain to be overcome. The other is easy, consisting only in the simple operation of inflating air-vessels within her. Let such be placed in confinement either in the hold, between the decks, or under lashings in small open sloops (to which your attention, Sir, seems chiefly paid), and they will operate with the most certain and powerful effect. For, though water, through its density, will expel air when at liberty, it can never in-croach upon it when properly confined. Secure, then, but a due portion of the lighter fluid in eligible situations, and the ingress of the grosser will be prevented. Consequently, though the sea run mountains high, and break over the sloop with the most tremendous surge, if the crew can secure themselves by lashing to the mast or rigging, and can at times have opportunity to supply the loss of air (which, through the inaccuracy of valves, air-cocks, &c. will sometimes happen), by a few additional strokes at the pumps, she will continue buoyant, in spite of elements, and be safe from the danger of sinking! Small vessels,

* See Falconer's Marine Dictionary, article CABLE.

under such circumstances; are liable, however, to be driven on shore; but, as they draw little water, their crews would probably be preserved.

“As yours, Sir, is the cause of humanity, I have troubled you with these particulars; and hope, that, as a possibility of relief appears, some Philanthropic Society or other will be induced to exert their endeavours for the preservation of the glorious tars of Britain.”

As the preceding scheme is supported, by its ingenious author, on true philosophical principles, and seems well calculated to keep a packet-boat, or vessel of small size, buoyant, as some successful trials on the model seem to evince; yet, as the apparatus rests on the instable basis of air and water, might not some difficulty arise, during a sea-storm, particularly in securing the air-cylinders, when destined to act externally on a large scale? It ought, therefore, to be subjected to the test of further experiment, both internally and externally, on vessels of different rates, as the invention certainly merits the attention of those who preside over maritime affairs. For, what keeps afloat a first-rate ship of war, with its immense freight of guns, stores, ammunition, and men, but the difference of specific gravity between air and water? What causes the ship to founder, but the accidental ingress of water, with a proportionate egress of air? In-

pervious air-vessels, therefore, properly placed, and inflated within the ship, would prevent the spaces thus occupied from being filled with water, and consequently bid fair to keep her buoyant, even though her upper deck became level with the surface of the sea. It was thus that the ship *Guardian* was prevented from foundering, whose packages and stores containing lighter fluids, such as spirits and air, which the water being unable to expel, alone kept the vessel afloat. Hence appears the utility even of empty casks if rendered impervious and immoveably fixed between the decks of a ship in distress.

The importance of the Art of Swimming and Diving.

According to the observations of a late able writer, we are assured that, on board the King's ships, not half, scarcely a third part, of the crew can swim; and that, for want of this, several, in the course of a voyage, have been drowned*.

Hence perhaps may be explained why so many sea-faring persons annually perish from shipwreck almost close to the shore. If but few escape, even by

* See Mr. Jeremy Bentham's Inquiry on Pauper Management, in Young's Annuals, for 1798, N° 174.

ting, it is because few British mariners are expert swimmers; a proof that an art so necessary to all ranks of men is too much neglected, since even those who are destined to a seafaring-life, and to man our fleets, are often wholly ignorant of it; at a period too when the life of every brave soldier or sailor is peculiarly valuable. Should it be asked, What can the art of swimming avail when contending armies rush to battle with the desperate purpose to slaughter or be slaughtered? Or, in naval conflicts, when ships and men are at once blown into the air, or engulfed in the bosom of the ocean? What can it profit when Death, thus in various shapes, sweeps away by shoals unfortunate human beings? Is it not thus that blossoms come forth only to be blighted? That infants peep into existence, suffer, and die? That men, like moths, play around the burning taper, and sink into the flame? In short, does not all this waste of germinating life demonstrate that it is not individuals, but the human species, that it is not men, but man, whose preservation is so necessary to the completion of the grand plan of the universe?

But allowing this argument its full force, it still affords no solid objection, since it cannot be denied that many individuals have been preserved by swimming, who otherwise must have perished. But of what do our fleets and armies, nay, the

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whole

whole human species consist, but of individuals? To preserve, therefore, individuals, is virtually to preserve and perpetuate the species, and consequently to obey the dictates of nature, in completing the grand system of the creation.

In order, then, to preserve as many individuals as possible, the art of swimming and diving ought to be established as an essential branch of national education; and, that our British youth may enjoy the same advantages which it procured to the ancient Greeks and Romans, it would be necessary in all sea-ports and towns bordering on large rivers to institute schools with experienced masters for teaching systematically the art of swimming and diving. To execute this scheme in the most speedy and effective manner, the illustrious Count Berchtold recommends the establishing a law for prohibiting Captains of vessels from engaging sailors ignorant of swimming; and for nominating commissioners, before whom, national sea-men should be obliged to exhibit proofs of their progress in this art, previous to their embarkation.

Formed by nature for the watery element, fishes can with wonderful facility preserve their equilibrium at different depths merely by contracting or dilating their air-bladders, a curious faculty, which, by the way, affords a beautiful

ful illustration of the efficacy of impervious air-vessels.

The young of other Animals also swim spontaneously; and though man, in consequence of his peculiar structure, cannot swim naturally, yet by practice he easily acquires the art, and when once learnt, it can never be forgotten.

Among savage nations, the young of both sexes are inured to this exercise from early infancy. Hence they soon become adepts in the art, and, regardless of a rough sea, they buffet the billows, and brave the dangers of the deep, which would soon swallow up less-experienced swimmers. From their daily employment in fishing and other aquatic expeditions, they also become able divers. In the East Indies, the negroe divers engaged in the pearl fisheries are said by habit to acquire such a power of retaining their breath as to remain under water from ten to fifteen, nay even twenty minutes! The expert diver therefore, in all maritime dangers, has a decided superiority over ordinary mariners who are novices in the art, being qualified not only to save his own life, but that of others; and, were it not for this, disasters from drowning would be far more numerous than they are. The celebrated, Dr. Franklin, a most expert swimmer, declares it to be one of the most healthy exercises in the world. After using it an hour in the evening, he

found that he enjoyed cool refreshing sleep the whole night, even during the most sultry heat of summer.

He mentions a curious experiment which he tried by holding the string of a paper-kite and following its motion whilst he floated on the surface of the water, by which he was carried on very pleasantly and performed his uncommon aquatic expedition with great velocity, and without fatigue. Nay, he thinks it not impossible to cross the sea in this manner, from Dover to Calais, though the packet boat, as he humourously adds, is perhaps still preferable.

In short, were swimming and diving regularly practised by our sailors and marines, it would not only contribute to their health and agility, but enable them to bear the frequent vicissitudes of heat and cold to which they are exposed; not to mention its known efficacy in curing inveterate diarrhœas and other obstinate chronic discharges, to which they are liable.

It would also qualify them to encounter, without fear, a rough sea, with a lee shore, for the purpose of fixing a line of communication with the coast. In this hazardous enterprize might not a paper-kite help to waft them through the stormy waves? In case of a naval victory, an experienced diver is enabled to plunge boldly into the deep to recover important dispatches thrown overboard in
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the heat of an engagement, or with equal alacrity in the moment of victory, to rescue the enemy in the act of drowning *. For it has ever been the glory and delight of an English seaman, expert in this noble art, to hazard his own life to save not only a friend but even an enemy, of which our naval history affords many illustrious examples.

Such transcendent acts of bravery and disinterested generosity deservedly render them dear to their country, and the admiration of their enemies!

Asylum for Shipwrecked Mariners.

I cannot finally dismiss the present subject without testifying my surprise that, amid the numerous charitable institutions established in Great Britain, which at once proclaim the opulence, the generosity, and the benevolence of the inhabitants, there should still be wanting one provision, of all others the most necessary, *viz.* a temporary Asylum, or house of reception for shipwrecked mariners; where, for a few nights, they might be provided with dry clothes, warm

*. In the Philosophical Magazine, vol. III. is described a new diving machine, in which the diver can, at 60 feet under water, view objects around him, and go directly to the particular spot. In searching, therefore, for a person drowned, this would seem far preferable to the present uncertain mode of using drags or nets.

beds, proper diet, and other necessaries. For what avails it to have escaped the dangers of the sea, if left to wander friendless and unknown, and at last to perish on a strange coast?

Therefore such an asylum, ever ready to open its friendly doors to distressed mariners of all nations, ought to be erected wherever the coast is peculiarly dangerous, where disasters most frequently happen, and where accommodations are most difficult to be obtained.

It may not be improper to add that the expence of building and supporting such asylums, though very considerable, ought in no wise to be deemed an insuperable objection. This might be defrayed by a small county rate, that would be scarcely felt by individuals, nay would be "lighter than the dust of the balance" when put in competition with the important object of preserving the lives of gallant seamen, and of administering comfort to unfortunate persons destitute of every thing, and ready to perish!

An object indeed, whether considered in a moral, a commercial, or a political view, cannot but be esteemed peculiarly interesting to the community, and consequently intitled to the attention of the legislature; since to British seamen this maritime country is principally indebted not only for its commerce, but its protection.

On whom can the Civic Crown be more properly bestowed than on those active and humane individuals

individuals who, through mechanical ingenuity, or personal bravery, rescue their distressed fellow-creatures from the disasters of the deep, and restore them to their families, their friends and their country? “Nulla enim re homines propius accedunt ad Deos, quam salutem hominibus dando.”

Since writing the above, I have been favoured with the following letter concerning an excellent institution of this kind, established, some time ago, under the auspices of the benevolent Dr. Sharpe, late Archdeacon of Northumberland. The plan being unique in its kind, and comprehensive in its nature, bids fair to realize every advantage that could be wished, and therefore cannot but afford sincere pleasure to every humane reader.

“SIR,

“From the many shipwrecks which have happened on our coasts, during the last year, and the number of lives and aggregate of property which must consequently have been lost, it is highly desirable that some mode should be adopted of lessening the dangers which so frequently menace such vessels as approach the rocky shores of these kingdoms, in boisterous and stormy weather. Each succeeding winter swells the melancholy list of sufferers, and increases the numbers

of those who have to mourn their relatives and friends, torn from them by the fury of the tempest. For this reason, I am anxious to lay before you, as a distinguished member of the Humane Society, the following short account of a very laudable plan that ought to be more generally known."

Humane Institution at Bamborough Castle for the preservation of lives and property from Shipwreck.

Signals from the Castle.

1st, "A great gun, a nine-pounder, placed at the bottom of the tower, to be fired in case any vessel be observed in distress; and the signal to be varied according to circumstances, in order that the Custom-house officers may hasten to give all possible assistance, as well as to prevent the wreck from being plundered.

2d, In every great storm, two men on horse-back are sent from the castle, to patrol along the coast from sun-set to sun-rise, that, in case of an accident, one may remain by the vessel, and the other return to alarm the castle. Whoever brings the first notice of the distress is entitled to a premium,

mium, in proportion to the distance from the castle.

3d, A large flag is hoisted when, on the Fern islands, any vessel is seen in distress, that the sufferers may have the satisfaction of knowing their disaster is perceived from the shore, and that relief will be sent to them as soon as possible. In tempestuous weather, the flag will be kept up; a gun fired morning and evening, and a sky-rocket thrown up, every night, from the North turret, till such time as relief can be sent.

These are also signals to the Holy Island fishermen who, by the advantage of their situation, can put off for the islands at times when no boat from the main land can get over the breakers. Premiums are given to the first boat which puts off for the islands, with suitable necessaries and provisions.

4th, A bell on the South turret will be rung in every thick fog, as a signal to the fishing-boats.

5th, A large weathercock is fixed on the top of the flag-staff, for the use of the pilots.

6th, A large speaking-trumpet is provided to be used when vessels are stranded, or in distress

near

near the shore, of which there have been many instances*.

7th, An observatory is erected at the East turret of the castle, where a person is stationed every morning at day-break, in the winter season, to watch the adjacent coast, for vessels in distress.

8th, Masters and commissioners of vessels in distress are requested to make such signals as are usual among persons in their unhappy situation."

The additional accommodations, supplied at this asylum, are

“ 1st, Rooms and beds for shipwrecked mariners, who will be maintained in the castle a week, or longer, according to circumstances; and during the whole time provided with all manner of necessaries.

* The patent signal trumpet (lately invented by Mr. Fitzgerald), to which a pistol or piece of ordnance can be screwed, is said to increase sound to such a pitch as to render the report of a common cartridge, fired through it, equal to that of a nine-pounder. Such an instrument therefore may prove highly useful to mariners in distress. *Repertory of Arts*, Vol. XI. p. 100.

As might also the Telegraph, which is now so much improved as to give signals by night, as well as by day.

2d, Cellars for wine and other liquors belonging to shipwrecked vessels, in which they will be safely deposited for one year, in order to be claimed by their proper owners.

3d, A store-house for the reception of all manner of goods, stores, or implements belonging to a ship recovered from the wreck. They will be entered in a book kept for that purpose, giving the marks and description of each, with the date when they came on shore.

4. Timber, blocks, tackles, handspikes, rudders, cables, ropes, pumps, and iron, all in readiness, for the use of wrecked vessels, and delivered at prime-cost.

5. Various implements for raising and weighing stranded vessels, even of 1000 tons burthen, when sunk on rocks, or in deep water; to be lent, gratis, to any person having occasion for them, within forty or fifty miles along the coast, on giving proper security to re-deliver them to the trustees.

6. Whenever dead bodies are cast on shore, coffins, and the whole funeral expences, will be provided, gratis."

Such a scheme of disinterested benevolence, supported by princely munificence, and carried on in an obscure corner of the island, without ostentation, is far above all praise! When more
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fully known, it surely cannot fail to awaken emulation, and give birth to similar asylums in this, and other maritime nations. For the whole community is interested in promoting it, and particularly all commercial companies, ship-owners, and insurers.

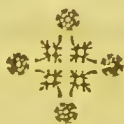
Now, in order to establish an institution of this sort, two methods present themselves: Public Benevolence; or, an Act of the Legislature, levying a small tax upon all vessels. For the execution of so extensive an undertaking, the latter seems preferable.

By such an act, commissioners should be appointed in London, and in all the maritime counties, under whose care the management of the different asylums ought to be conducted. The expence of each building, on a smaller scale, need not to exceed four hundred pounds. A serjeant's guard, drafted from the neighbouring military, should be regularly quartered at each station, to preserve order, and drive away plunderers. The neighbouring fishermen and inhabitants might be formed into a company, to assist on every emergency, and to be rewarded according to their exertions. The family of one of these might be allowed to reside in the house, rent-free, to keep every thing in due order. At each station an exact register ought to be kept of every vessel stranded, the articles saved, the names and places
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of abode of the crews and passengers, &c. This register, at the close of the year, ought to be transmitted to the Commissioners in London, under whose inspection the particulars ought to be published, for the satisfaction of parties concerned, and to enable the public to estimate the utility of the institution, and induce neighbouring nations to imitate the plan.

Having now extended this voyage of observation beyond its original destination, behold new objects present themselves to view, which solicit my attention. Being as yet, however, only a fresh-water sailor, and my vessel but indifferently rigged, I must forbear launching into a wider sea: shall hasten, therefore, to steer my little bark into the friendly port to which it is bound.

THE END.



CORRIGENDUM.

Page 13, line 22, *after* expected, *read* at.

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